

DECISION SUPPORT FOR ADAPTATION



DISCUSSION PAPER



Prepared for the Hunter & Central Coast Regional
Environmental Management Strategy



This project is delivered under the Hunter and Central Coast Regional Environmental Management Strategy (HCCREMS): a program of the Environment Division of Hunter Councils



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1. Introduction

1.1 Project overview

The Hunter and Central Coast Regional Environmental Management Strategy (HCCREMS) has received funding from the Commonwealth Government to deliver the project ‘Decision Support for Adaptation Action’. Funding is provided through the Coastal Adaptation Pathways Initiative, administered by the Department of Climate Change & Energy Efficiency.

The focus of the project will be on developing an integrated Decision Support System (DSS) to assist with the assessment and planning for existing and new land use development and infrastructure in vulnerable coastal areas. Specific components of the DSS will include:

- a process for evaluating the direct and indirect costs and benefits of adaptation options that consider a range of ‘fit-for-purpose’ tools and methods;
- appropriate decision-making triggers and a process to monitor progress toward identified trigger points, thereby informing the timeframe for implementing identified adaptation pathways;
- regional performance and design criteria / principles for development and infrastructure located in vulnerable coastal areas; and
- a User Guide to assist practitioners apply the framework to the identification, assessment and implementation of adaptation measures.

Other outputs of the project will include:

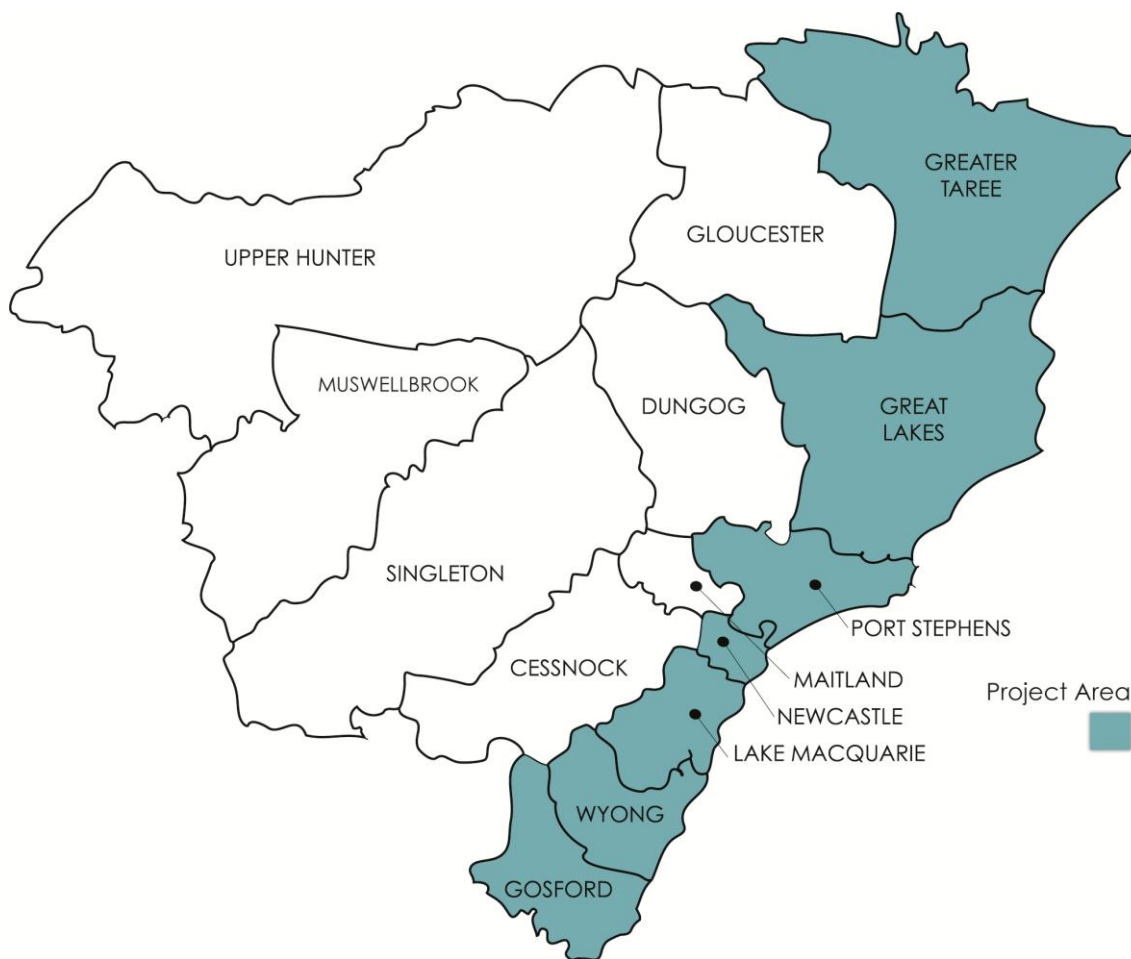
- piloting the application of the DSS in 2-3 vulnerable coastal localities; and
- a training program to build organisational capacity in applying project outputs.

The objective of the DSS is to improve the ability of councils in the Hunter, Central & Lower North Coast region (see Figure 1) to implement adaptation approaches in coastal localities vulnerable to the impacts of climate change and to facilitate a more consistent and transparent approach to decision making within and across councils and other stakeholder organisations, particularly with respect to land use and asset planning and management in coastal areas.

In doing so the project will seek to transform their organisational capacity to adaptively manage the complex interplay of environmental, social, economic and governance factors influencing planning and land use decisions with respect to climate change.

The project seeks to engage directly with the seven participating HCCREMS coastal councils (Gosford, Wyong, Lake Macquarie, Newcastle, Port Stephens, Great Lakes and Greater Taree – see Figure 1) and with several other stakeholder organisations, including the Office of Environment & Heritage, Department of Premier and Cabinet, Department of Planning, Land and Property Management Authority (Crown Lands), and energy & water utilities with the aim of ensuring that the DSS meets the needs of coastal councils and other coastal decision makers in the region.

Figure 1: The project area and the seven coastal councils it comprises



Source: HCCREMS

1.2 Purpose of this discussion paper

The purpose of this paper is to promote discussion around the purpose and key attributes of the DSS. To do this the paper provides an outline of the proposed DSS, examining the major steps or features of the system and pose questions around those steps. The questions and responses by you (the practitioner) to these questions will provide the basis for a practitioner workshop to be held on 11th October 2011. At that workshop we will seek to:

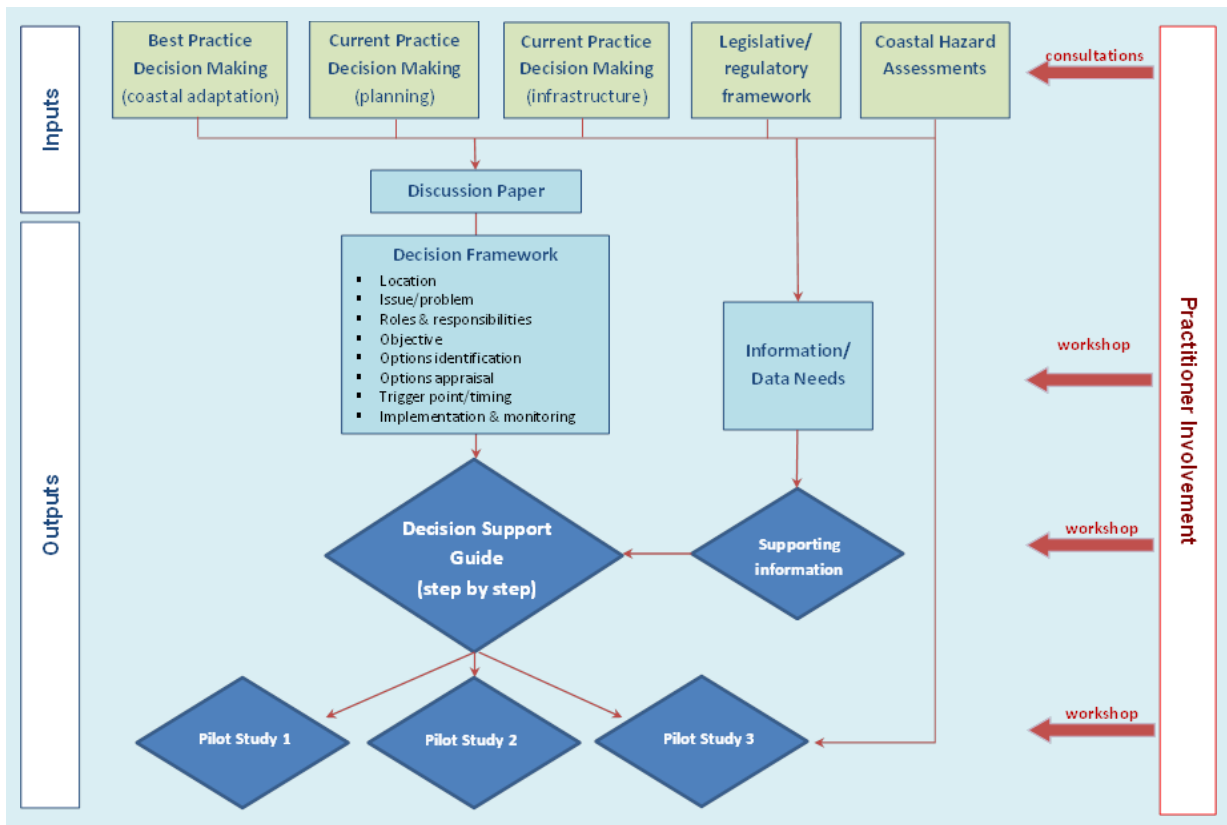
- clarify expectations regarding the DSS and issues that the DSS will apply to;
- agree on the major features of the system;
- agree on major information needs for the systems; and
- agree on a process for preparing and testing the DSS.

2. Decision support system overview

2.1 Project approach – inputs and output

The proposed approach to the project – development of the DSS – is outlined in Figure 2 below. This approach has been discussed and agreed upon with stakeholders in previous consultations. Nevertheless, there are aspects of the approach relating to project outputs that the project team is particularly interested in receiving feedback on.

Figure 2: Project inputs and outputs



Source: Marsden Jacob Associates

Information sources and gaps

In developing the DSS, we will take into account and draw on:

- information about best practice decision making, with a particular emphasis on decision making on coastal planning and management issues;
- current approaches to decision making by councils and agencies on planning and infrastructure issues;
- the legislative and regulatory framework that is currently in place in New South Wales; and
- coastal hazard assessments, estuary management plans, flood risk management plans and sea level rise studies that have been undertaken or are being undertaken in the region.

As the process of developing the DSS is undertaken we will be seeking to identify key additional information sources that are required and/or will be useful at each step in the decision making process. We are keen to understand however, where there are gaps in information that will be required to effectively apply the DSS.

Decision support guide

A key output of the project will be a user guide that assists practitioners in applying the DSS to the identification, assessment and implementation of adaptation measures. It is intended that the guide will provide step-by-step guidance on application of the DSS as outlined in section 2.2. The DSS and Guide will seek to balance the need for detail on the one hand, given the array and complexity of issues to be addressed, and our desire to ensure that the Guide is user friendly on the other hand. This could be achieved through a layered series of questions and answers accompanied by supporting documents and references.

Pilot studies

Another important output of the project will be a series of pilot studies to test the suitability and applicability of the DSS and Guide. The intention is that these pilot studies will be initiated in-house by councils but with support from the project team. The pilot studies could be location or issue based studies. Feedback to date suggests that there is preference for location based pilot studies that capture a range of issues at particular localities. Before selecting pilot studies though, it would be useful to agree on criteria that would inform selection of those studies. Possible criteria include:

- even spread of pilot studies across municipalities;
- collectively, the pilot studies address a range of issues (land use planning; statutory planning, infrastructure and assets);
- hazard assessment has been / will soon be completed for the proposed locality; and
- pilot study will not be restricted by major confidentiality issues.

Questions for practitioners

Are you aware of any gaps in information that will be needed to effectively apply the DSS?

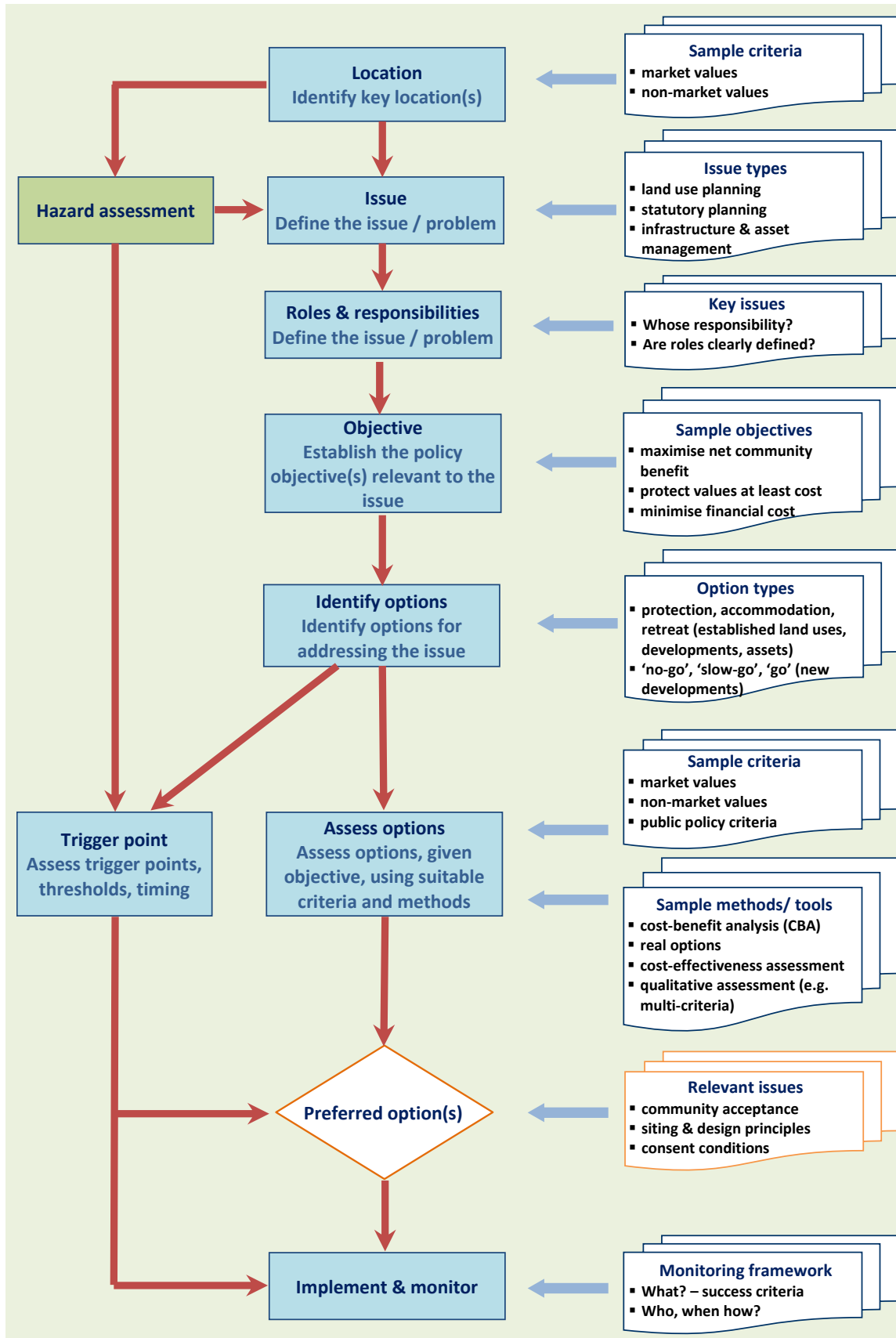
Do you have any views or suggestions on how you would like to see the User Guide structured and styled? Can you point to an existing guide (used in other areas) that could provide a useful template in terms of structure or style?

What criteria should be adopted as the basis for selecting project pilot studies?

2.2 Decision support system outline

Figure 3 provides an outline of the key steps or features of the proposed coastal adaptation DSS. A DSS is a structure or logic for guiding councils and other decision makers through a process of best practice decision making. The DSS structure proposed for this project is intended to comprise a series of steps, with questions posed at each step and resulting responses influencing subsequent steps in the decision pathway.

Figure 3: Outline of proposed decision support system



Source: Marsden Jacob Associates

The main steps in the decision pathway comprise:

- defining the issue;
- identifying and prioritising key vulnerable locations (this step could come before or after definition of the issue);
- determining roles and responsibilities in relation to the identified issue;
- establishing the policy objective in relation to the identified issue;
- identifying adaptation options;
- assessing options;
- establishing suitable trigger points or thresholds for implementing options; and
- implementing and monitoring the preferred option or options.

Each of these steps is discussed in more detail in the following section.

Questions for practitioners

Are there any key steps missing from the proposed DSS?

Are the steps (as outlined in Figure 3) sequenced appropriately for the sorts of issues that your council or organisation is interested in?

3. Steps in the decision support system

3.1 Defining the issue

As previously noted, a DSS is a structure or logic for guiding councils and other decision makers through a process of best practice decision making. The DSS to be developed through this project is intended to apply primarily to adaptation decisions in response to impacts and hazards linked to climate change in the coastal zone.

For the purpose of this project, we intend to define the coastal zone broadly to include:

- the open coast – beaches, dunes, cliffs, headlands and foreshore areas;
- estuaries, wetlands and lagoons, coastal lakes, and tidal river systems; and
- surrounding catchments and hinterlands.

This is a much broader definition than the legal definition of the coastal zone in NSW, defined as 1km inland from the low water mark out to three nautical miles seaward. The broader definition adopted here is more useful from a coastal zone climate change adaptation point of view as it covers the full range of coastal features likely to be affected by climate change impacts.

The principal impacts of climate change for the coastal zone that will need to be considered through the DSS include:

- sea level rise;
- coastal recession associated with more frequent or severe storms, storm tides, and changes to coastal currents and other coastal processes;
- changes to extreme rainfall and associated flooding (rivers and flash flooding) in the coastal zone; and/or
- a combination of these events.

It is understood that these impacts may well affect the open coast differently to estuarine and tidal river areas, with storm surge being more of an issue for the open coast, for example, and sea level rise and flooding being a concern primarily for estuaries and tidal rivers. Likewise, the timing of impacts will differ. For example, there are already significant changes occurring along some open coasts, with extensive coastal recession occurring in some parts of the region.

This recession could be linked to existing natural processes and may or may not be related to sea level rise or other climate changes experienced to date. It is likely however, that future climate changes will exacerbate the recession. Permanent inundation associated with sea level rise, on the other hand, is less immediately apparent and is more likely to affect tidal rivers and estuaries. Issues associated with triggers, thresholds and timing are discussed further in section 3.7.

Existing and anticipated impacts raise a number of issues for local councils and other regional decision makers. For the purpose of developing the DSS we have categorised these issues into three broad groups:

- land use planning (including zoning and management of beaches, foreshores and estuarine areas, implemented through Local Environmental Plans, Coastal Management Plans, Estuary Management Plans, Flood Risk Management Plans etc);
- statutory planning (as implemented through Development Control Plans, State Environmental Planning Policies etc); and
- infrastructure and asset planning and management.

The issues associated with each of these three categories are briefly outlined below. Under each issue, we indicate a number of key concerns that we think will need to be addressed as part of the DSS. An important part of the workshop however, is to ensure that these are the right issues. Hence they are posed here as indicative, to be discussed and modified or confirmed at the workshop. The steps represent questions that need to be asked, and answered, as part of the decision making processes for councils, infrastructure and utility providers in the region.

Land use planning

Land use planning is the process by which land is allocated to a variety of competing uses to provide for community welfare by balancing the need for economic development with social and environmental amenity. Land use zoning is a more detailed regulation of specific activities that are allowed on particular parcels of land within a land use plan. Both land use planning and land use zoning can play a significant role in how the impacts of climate change will affect different segments of the community and systems in coastal areas. Issues facing land use planners in coastal areas vulnerable to the impacts of climate change include:

- whether to continue with the current ‘mix’ of land uses in those areas;
- if so, how best to protect or accommodate those land uses and associated assets; or
- if not, how, where and when to seek changes to land uses.

These choices are complicated by a number of issues, such as:

- uncertainty about roles and responsibilities or coordination between jurisdictions,
- a wide range of potential economic, social and environmental impacts arising from the different choices; and
- uncertainty about legal liability.

Statutory planning

The impacts of climate change on processes, such as flooding or coastal erosion and recession, raise a number of issues for existing and new developments. Building and infrastructure standards and development conditions can provide protection against some climate change impacts, and/or change some of the costs of climate change borne by businesses, households or others in the community.

There are a number of decisions to be made in relation to building standards and development conditions. It is much easier to build protection against climate change risks into standards and DCPs for new developments than it is to retrofit existing developments. Hence it will be important to consider the issues for new and existing (legacy) developments separately.

Key decisions to be made for new developments include:

- Should developments be permitted in vulnerable areas?
- If so, are current building and design standards adequate? What is best practice?
- What are the costs and benefits of upgrading standards?
- Will standards need to change over time? If so, what will trigger those changes?

Key decisions to be made for existing (legacy) developments include:

- Should these developments be protected? Is there a distinction between public and private assets?
- If they are not to be protected, should abandonment and retreat be an active policy or should nature simply be ‘let to take its course’?
- What are the costs and benefits of protection versus retreat versus accommodation?

- If active retreat is the preferred option what will trigger its implementation?
- Who should pay for adaptation / retreat measures?

Infrastructure and asset planning and management

There is a range of public assets at risk from climate change impacts in the coastal zone, including:

- built assets such as roads and other transport infrastructure, water and waste water infrastructure, energy and telecommunications and community assets (schools, hospitals etc); and
- natural assets such as beaches, wetlands, terrestrial ecosystems, parks and foreshore reserves.

Many of the issues that need to be addressed by infrastructure managers are similar to those outlined above for statutory planning. That is, the initial decision for infrastructure managers in the face of potential coastal impacts is whether to protect the assets, upgrade and redesign them or move them elsewhere, considering the costs, benefits and timing of these options.

An additional issue that infrastructure managers may need to consider is the effect of adaptation decisions on the rest of the network. In particular, a decision to retreat by withdrawing infrastructure – such as a road, or electricity lines, or water and sewerage services – from a particular location may leave downstream parts of the network technologically or economically unviable. Furthermore, withdrawal of services may render parts of a community unliveable, for example, if water and sewerage services are cut to some residents or businesses. Hence infrastructure decisions involve additional issues beyond the direct question of retreat, protect or adapt.

Questions for practitioners

Has the coastal zone been appropriately defined, as outlined above for climate change adaptation decisions?

Have we identified the full range of coastal adaptation issues as outlined above under the three broad categories: land use planning; statutory planning; and infrastructure and asset planning and management?

Do coastal adaptation issues differ between the open coast and estuarine/ tidal river areas?

3.2 Identifying and prioritising locations

In many cases priority vulnerable locations will already be known to councils and other coastal decision makers, either because coastal impacts are already being felt and need to be addressed immediately or because hazard assessments and other studies have identified the localities as being areas of future concern.

In some cases however, priority vulnerable locations may not have been determined, either because hazard assessments have not been undertaken or because many vulnerable locations have been identified and the problem is one of prioritising between those locations for future adaptation actions. In these circumstances it may be necessary to establish a process for prioritising hazard assessments and/or adaptation actions that considers the relative values of different areas to the council and/or community and captures those values in a clear, transparent and consistent manner.

This, in turn, is likely to entail establishing a range of assessment criteria (probably reflecting financial (market) benefits and non-market values) and assessing locations against those criteria.

Questions for practitioners

Is the issue of prioritising locations for the purpose of hazard assessment and/or adaptation actions a significant one for your council or organisation? If so, do you want guidance in the DSS on prioritising vulnerable locations?

How is your council currently prioritising between locations?

3.3 Governance responsibility

Local government has a clear responsibility for coastal management, including climate change impacts, with roles and responsibilities including:

- land use planning and statutory planning development control for infrastructure developed by others;
- construction, management and maintenance of some coastal infrastructure, as well as other civil infrastructure in the coastal zone including stormwater infrastructure, transport infrastructure and (in some cases) waste water infrastructure;
- management of public access to and use of the foreshore;
- community awareness, development and engagement; and
- some aspects of environment protection, enhancement and management.

As well as local governments, a range of national, state and regional stakeholders and agencies are charged with responsibilities for coastal management in the region, including:

- the Federal Department of Climate Change and Energy Efficiency;
- the NSW Office of Environment & Heritage;
- the NSW Department of Premier and Cabinet;
- the NSW Department of Planning;
- the NSW Land and Property Management Authority; and
- State agencies - Ports, Utilities, RTA, Emergency Services.

Likewise, the coastal management framework is implemented at national, state, regional and local levels, with key legislation, regulations and policies at the State, regional and local levels summarised in Table 1.

Planning, policy development and coastal management actions are occurring at national, state, regional and local levels. Because of the large number of different stakeholders with responsibilities for coastal infrastructure management and planning, there may be uncertainty or a lack of clarity regarding the management roles and responsibilities of the various parties for some coastal issues. This can potentially result in duplication of roles and responsibilities, jurisdictional confusion and lack of continuity in decision making.

During the preliminary consultation process conducted for this project, issues raised by Hunter Coastal Councils and NSW State agencies included:

- the need for State Government direction to ensure adequate and consistent approaches by councils to managing issues, including planned retreat;
- the need for effective and consistent communication processes between community, councils and government;
- clashes between recommendations / options within flood studies and estuary management plans due to competing objectives;

- uncertainty whether councils can apply stricter requirements in relation to sea level rise than are imposed by current regulations and standards; and
- directions from a political level can be inconsistent with preferred adaptation strategies.

Questions for practitioners

Is there uncertainty or a lack of clarity regarding the roles and responsibilities for coastal planning and management?

If so, where is the lack of clarity (to what coastal planning and management issues and stakeholders does it apply)?

Do climate change issues exacerbate any uncertainties regarding roles and responsibilities for coastal planning and management?

Table 1: Principle legislation, regulation and policies for coastal management in NSW

Framework level	Details	Comments
NSW legislation	Coastal Protection Act 1979	Requires the preparation of coastal management plans and contains provisions relating to the use and supervision of the coastal zone and the carrying out of development within the coastal zone
	Coastal Protection and Other Legislation Amendment Bill 2010 and associated policies and guidelines	Associated policies and guidelines include: Coastal Risk Management Guide: Incorporating Sea Level Rise Benchmarks in Coastal Risk Assessments
	Coastal Hazard Policy 1988	
	Environmental Planning and Assessment Act 1979	Gives NSW Government and local councils responsibility for local environmental planning and development approvals
	Local Government Act 1993	Gives local councils responsibility for the management of community land, including most beaches
NSW Government Policies	NSW Coastal Policy 1997	NSW Government’s overarching strategic policy document for the NSW coast; establishes statewide directions on protecting the coastline and coastal values from excessive development
	Sea Level Risk Policy Statement	Provides guidance on adaptation to projected sea level rises
	State Environmental Planning Policies (SEPPs)	e.g. SEPP 71 provides guidance on coastal protection - regulates development in coastal areas and prohibits certain types of development
	Guidelines for preparing Coastal Zone Management Plans	
LGA level plans and policies	Local Environmental Plans (LEPs)	Must comply with the NSW Government’s Standard LEP template
	Development Control Plans	Provide guidance and establish controls on development in LGAs, including specific controls for coastal areas
	Coastal Zone and Flood Risk Management Plans	Prepared in accordance with NSW Government guidelines
	Local Area Plans, Climate Change / Sea Level Rise policies and Local Adaptation Plans	Local Area Plans provide specific development guidelines for local issues not adequately addressed in DCP
	Section 149 Planning certificates	Issued on request for individual properties, usually at the point of sale of a property, to advise interested parties of the policies that may affect the land or apply if a new development is proposed on the land.

3.4 Establishing the policy objective

Once the issues are appropriately defined and the key affected locations identified, establishment of a clear policy objective becomes critical to:

- clarifying the ultimate policy goal; and
- allowing for the appropriate identification and assessment of options designed to achieve that policy.

A number of potential and possibly competing policy goals exist for Councils. It is important to separate and prioritise these objectives, as a decision support tool cannot maximise differing objectives concurrently.

Policy goals could include:

- maximising net social welfare (the overall welfare of society, including costs and benefits accruing to all members of society – individuals, businesses, government);
- minimising council (or whole of government) risk and financial exposure;
- minimising environmental impacts;
- minimising private individual risk and financial exposure; or
- considering distributional/equity impacts.

Maximising net social welfare involves a full assessment of (market) financial costs and benefits to all parties, as well as ‘non-market’ costs and benefits. Non-market costs and benefits are not paid for or received in financial terms, such as reduced social amenity from loss of beach access, or the impact on recreational fishers of lost boating infrastructure.

The choice of policy goals critically influences the identification of options to achieve these goals, and the choice of tools to assess relative performance of those options.

Questions for practitioners

Should the DSS include guidance on establishing and prioritising the policy goals of councils and other decision makers?

3.5 Identifying options for achieving policy objective

Councils and other decision makers will typically be aware of a range of options to address key challenges facing their communities due to coastal exposure to the impacts of climate change.

Options relating to established land uses, assets and infrastructure essentially fall into three broad types:

- **‘Protect’** – defensive structures to protect settlements, infrastructure or natural assets.
- **‘Accommodate’** – redesign or other changes to the assets to accommodate or mitigate the impacts.
- **‘Retreat’** – move or enable the asset to retreat to an area less exposed to the impact.

Options relating to new developments also fall into three broad types:

- **‘No go’** – do not permit new developments or land uses in exposed areas.
- **‘Slow-go’** – permit developments or land uses but with additional or revised conditions of consent.
- **‘Go’** – permit developments under established conditions of consent.

There are many potential variations on these broad types of options depending on the particular issue or location but not all types of options will necessarily be available under all circumstances. On the other hand, options are not necessarily mutually exclusive – it may be possible to apply different types of options over

time as circumstances change (see section 3.7). It is also important to understand that for most, if not all issues, the *'do nothing / business as usual'* option is available to decision makers but that this option will have consequences and costs to councils and/or the broader community. An important aspect of the 'do nothing' option is that it provides a base case option or scenario in the assessment process (see section 3.6).

The project team is not anticipating dwelling on option identification in detail in the DSS, beyond promoting the exploration of a full range of options. If there is interest from councils however, the DSS could include a framework for option identification.

Questions for practitioners

Should the DSS include guidance on identifying options?

3.6 Assessing options

The project team will provide guidance assisting councils in the assessment of options for responding to climate risk. A range of tools is available for option assessment, with varying relevance to councils for specific use depending upon:

- data availability;
- technical requirements of assessment tool;
- available budget;
- timeframe; and
- policy objective.

The project team will provide an overview of each relevant assessment tool (rather than a detailed guide for each), along with reference material pointing to more detailed work for interested parties. The relative strengths and weaknesses of each tool will be provided, along with advice on when to use a specific tool and why.

The project team will review relevant literature before developing and populating a framework for assessing identified options, with a focus on incorporation of risk, and flexibility of response under changing circumstances. Standard frameworks for option assessment include:

- **Cost Benefit Assessment (CBA):** CBA is a rigorous and systematic process for assessing the costs and benefits of a decision and/or options, compared to an alternative (the 'without project' case). Costs and benefits are estimated in dollar terms to allow for comparison, requiring detailed data supporting both costs and benefits. Its main strength is its defensible rigour; its main shortcoming is difficulty in monetising benefits, especially social and environmental benefits (see 'Non-market valuation techniques' below).

It is noted that there are other potential shortcomings with CBA with respect to assessing climate change adaptation options. These relate in particular to dealing with uncertainty and correctly account for low-probability, high-impact events. The DSS will therefore also include guidance on techniques that enable the use of extreme values associated with climate impacts, damage estimates and adaptation costs to be incorporated into CBA. The goal of these types of technique is to explore whether sensitivities result in different decisions compared to standard CBA.

- **Cost Effectiveness Assessment (CEA):** CEA is used where the benefits are acknowledged to be very difficult to quantify (or would be the same for a variety of alternative projects). As opposed to CBA, CEA produces ratios of cost to a given benefit, avoiding the need to quantify benefits in dollar terms.
- **Real Options Analysis (ROA):** ROA is an extension from analysis within corporate finance, focussing on decision making under circumstances of uncertainty. As risks and uncertainty change over time,

ROA assumes an active management of investments to allow for changes to investment in response, unlike CBA which accounts for these issues using different discount rates. It is considered useful for strategic investments in which significant uncertainty exists at the commencement of the project, potentially providing a useful tool for dealing with climate risk and uncertainty.

- **Multi-criteria analysis (MCA):** MCA is a decision making framework which allows for several criteria to be concurrently used in one analysis. Especially useful for projects with critical considerations that are considered too difficult to quantify in dollar terms, MCA allows for these to be introduced as rankings, ratings or other non-monetised inputs.
- **Other qualitative assessment approaches.** Other methods for qualitatively assessing adaptation options will also be explored in the DSS. For example, ‘best practice’ criteria and principles are already available for options assessment and policy development. These may be particularly useful for planning decisions.

The range of ‘values’ – market and non-market – that will need to be considered in relation to the major categories of issue (see 3.1) will also be discussed and guidance provided on how best to incorporate those values into the assessment. This will include:

- **Non-market valuation techniques:** these are a range of tools used to estimate dollar values for goods and services that are not bought and sold in traditional markets. For example, the value of an aesthetic view or a destination beach, or the ecosystem services provided by undisturbed native vegetation. These tools are typically divided into Revealed Preference methods (Travel Cost Method, Hedonic Pricing Method) and Stated Preference methods (Contingent Valuation Method, Choice Modelling Method). All of these will be summarised, exploring relevant use in valuing impacts associated with climate change.
- **Benefit transfer** is used when a small budget or short timeframe prevents the development of specific non-market values for a project, and allows for the results of a similar project to be methodically and defensibly transferred to the current assignment. This allows for the ‘order of magnitude’ values to be understood, without incurring the significant cost of data collection and analysis. There is a trade-off of cost and accuracy, however.

For quantitative approaches (e.g. CBA, CEA), the project team will explore the appropriate use of discount rates, providing councils with a logical discussion of the use of different discount rates under different circumstances, and suggestions for their use. The project team will also suggest scenarios for ‘sensitivity analysis’. Sensitivity analysis is undertaken when one or more key assumptions used in an analysis may significantly alter the outcome of the analysis if it does not hold. For example, if the capital costs of a project could reasonably be expected to double, a sensitivity analysis would be undertaken to explore the impacts of this assumption on the analysis outcome.

The relevance of each assessment tool for different types of issues and circumstances will be discussed in the DSS, noting that in general terms quantitative type analyses (e.g. CEA, CBA) will be applicable where the costs (and benefits) of options are known, significant and readily quantifiable, whereas qualitative methods will be more relevant where costs and benefits are unquantifiable and/or likely to be relatively minor. For some issues it may be possible to adopt hybrid tools whereby ‘order of magnitude’ or ‘relative’ estimates of some costs or benefits are undertaken (e.g. time, cost of securing data). The DSS will also provide guidance on techniques to assess these types of costs.

The DSS will also provide guidance on the level of expertise required to apply the different types of tools or methods.

Questions for practitioners

Are there any other tools or methods, not discussed above, that you consider relevant to assessing options?

What tools have you previously used to assess coastal adaptation options? What difficulties have been experienced in applying those tools?

3.7 Thresholds and trigger points

Councils and other coastal decision makers are required to make decisions under uncertainty, both in terms of the severity of climate change impacts and the timing of those impacts. This requires a flexible and adjustable adaptation strategy, which allows councils to respond to changing circumstances, if and when required.

Such adaptive strategies rely on thresholds or trigger points, which serve as 'red flags' and prompt a management response and/or implementation of a predefined option or set of options.

The project team will prepare a guideline for developing trigger points or thresholds in the context of climate change adaptation, providing advice on:

- circumstances suitable for the use of triggers and thresholds;
- different types of thresholds and trigger points; and
- key success criteria and pitfalls.

The project team will draw on relevant literature to develop a structured framework for deriving thresholds and trigger points for management action and/or implementation of adaptation options.

The following steps need to be considered in the development of thresholds and/or trigger points for the implementation of adaptation options:

- definition of the objective (see also section 0) and the scope (e.g. the area, infrastructure, resources affected). *What does Council want to achieve? Which areas, infrastructure, etc. does Council want to protect?;*
- identification and selection of an appropriate indicator or indicators to provide a measure of the potential vulnerability of the asset or area and to trigger a response – either thresholds (e.g. inundation levels, coastal recession lines) or timelines (e.g. 2030, 2050, 2100) – *What indicators are best suited to triggering an adaptation response, (physical) thresholds or time based triggers?;*
- setting an acceptable and/or tolerable range for the indicator, threshold or timeline, avoiding 'false alarm' and maladaptation, but at the same time taking into account a margin of error or safety margin – *What changes to the indicator are 'natural', acceptable, tolerable?;*
- setting monitoring intervals – *how frequently is it feasible or necessary to measure / monitor the indicator (especially when considering physical thresholds)?;*
- defining the response time (e.g. council approval, construction of infrastructure) – *how long will it take to implement the adaptation option?;*
- projecting changes to the indicators into the future based on available information, again including a margin of error – *How quickly do changes in the indicator occur? How quickly will the acceptable range be reached?;*
- establish trigger points or thresholds for intervention and adaptation action, taking into account the required lead time (e.g. monitoring intervals and response time) and indicator projections, for implementing the adaptation response – *At what stage, at what measure of the indicator are adaptation actions required to prevent crossing the acceptable range?;*

In using trigger points or thresholds it will be necessary to distinguish between recurring events (e.g. flooding associated with storm tides) and one-off events (e.g. coastal erosion or permanent inundation).

A one-off event with irreversible outcomes will require highly sensitive and well-defined thresholds. By contrast, the sensitivity and monitoring of trigger points for responses to recurring events will depend on the severity of the impacts. It is also possible that a small number of observations of the indicator appearing out of the acceptable range during a certain period of time (e.g. once or twice a year) are considered acceptable and a response will only be triggered, if the indicator appears 'out of range' repeatedly.

Questions for practitioners

Do you have any experience with the application of trigger points or thresholds in coastal planning or management issues? Can you point to any examples where trigger points or thresholds have been or are being effectively applied? What do you see as the advantages or disadvantages of physical thresholds versus time based triggers?

3.8 Implementation, monitoring and evaluation

Once preferred options have been selected and triggers for their implementation have been identified it will be important to put into place sound implementation, monitoring and evaluation processes. Drawing on best practice procedures, the DSS will include an implementation, monitoring and evaluation framework that provides guidance on issues such as:

- who should be responsible for implementation and monitoring of options;
- how and when monitoring should occur;
- criteria for assessing the effectiveness of options; and
- options review.

Questions for practitioners

Are there any particular aspects of options monitoring and evaluation that you or your organisation is seeking guidance on?

3.9 Community engagement processes

Many sound policy decisions or programs fail to come to fruition through lack of understanding and/or support from stakeholders and the broader community. Thus it is essential that all decisions on coastal adaptation having major implications for the community include a significant community engagement component. The principles of good community engagement include:

- clarity of purpose;
- inclusiveness and diversity;
- engaging processes;
- relationships and trust;
- responsiveness and feedback; and
- informed deliberation.

The DSS will discuss these principles in more detail and provide guidance on when and in what circumstances community engagement should occur.

Questions for practitioners

Are there any particular aspects of community engagement that you or your organisation is seeking guidance on?

DECISION SUPPORT FOR ADAPTATION



Project Partners

